VOL. 1. NO. 9.

AMERICAN
VETERINARY REVIEW.

A. LIAUTARD, M. D. V. S., Editor,

ASSISTED BY

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PUBLISHED BY THE

UNITED STATES
VETERINARY MEDICAL ASSOCIATION.

NOVEMBER, 1877.

New York:
STYLES & CASH, GENERAL STEAM PRINTERS & STATIONERS, 77 EIGHTH AVE.

1877.

CONTENTS.

	Page.
ORIGINAL ARTICLES.—Texas Fever. By JOHN MYERS, Sr.	269
The Histology of the Mammary Gland of the Cow, and the Pathological Changes of the Same by Perlsucht. Translated by F. S. BILLINGS	276
EDITORIAL.—Veterinary Science	289
Philadelphia Veterinary Diploma Shop	291
TRANSLATIONS AND EXTRACTS FROM FOREIGN JOURNALS—By A. LIAUTARD, M. D. V. S. Rheumatismal Synovitis	292
Immobility due to a Soft Fibroma of the Lateral Ventricles of Cerebrum, with Dilatation of the Right Heart, of an Aged Horse	293
Death from Rupture of the Right Pelvi Crural and Other Venous Trunks	294
Double Scrotal Hernia	295
Melancholy Death from the Bite of a Rabid Dog Three Years Ago	296
TRANSLATIONS. By Dr. OSLER. On Changes in the Brain in Hydrophobia	297
The Trichina Epidemics of Saxony	298
Influence of Hunger on the Weight of Cattle	299
AMERICAN VETERINARY COLLEGE. Opening	300
CORRESPONDENCE	301
REPORT OF CASES.—Punctured Wound of the Chest. Death. By A. DRINKWATER	304
EXCHANGES	305
COMMUNICATIONS RECEIVED	305
REGULAR GRADUATES	305

Page.
r..... 269
he Patholog-
ted by F. S.
..... 276
..... 289
..... 291
URNALS—
ovitis..... 292
les of Cere-
ed Horse .. 293
ther Venous
..... 294
..... 295
Years Ago.. 296
n in Hydro-
..... 297
..... 298
..... 299
..... 300
..... 301
eath. By A.
..... 304
..... 305
..... 305
... . 305

AMERICAN VETERINARY REVIEW,

NOVEMBER, 1877.

ORIGINAL ARTICLES.

TEXAS FEVER.

By John Myers, Sr., V. S., Cincinnati, Ohio.

The daily news are now circulating reports of the so-called Texas cattle plague prevailing in Cleveland, and in some parts of Michigan. This put me in mind again of an article on the same subject I had written, and intended for the *Repertorium der Thierheilkunde*, that journal having several times referred to the disease. The delay of transferring it to its contemplated destination is due to the intention of adding to the description, if possible, a more diagnostic value by the analysis of the blood, but have not, to the present date, been able to procure any, as the disease has not made its appearance since in this vicinity. Now, the article does not correspond altogether with the present state of affairs, but I will submit it just as it was composed at that time to the Review, the standard messenger of the interests of American veterinarians, to disclose if agreeable.

The scrupulous management of the sanitary police ordination on the eastern continent partly, and partly the contemplated exportation of American cattle induced me to draw the attention of the veterinary medical profession to this enzootic, viz.: Texas cattle plague, Texas fever, Spanish fever, and splenic fever, the propagation of which is thought to be produced by contagion. The virus generated within cattle of the Gulf region (being endowed with mysterious properties), which is transferred by them in the eastern and central States, where they deposit and diffuse the malady amongst the cattle with which they come in contact, whilst their own health remains unimpaired.

Considering these circumstances, it is quite probable that the authorities of such districts in which foreign cattle are unloaded will enforce protective measures against the invasion of plagues, and, more-

over, should one or more amongst a lot of these bovine emigrants prove indisposed, which is very likely the case when such dumb animals that have never been incarcerated before are doomed to a fortnight's rail or sea journey, they would make their inspection with even more precision. As to what extent such sanitary precaution is necessary, the here deposited facts in reference to the disease may be taken into consideration. As incomplete as they are, I deem it justifiable to communicate fragments, expecting by these means to stir up scattered relative substance which might in the end serve as a foundation of trustworthy instruction as to how this evil might be prevented and cured.

Symptomatology.—This disease compared with, or even taken for anthrax, is characterized by a painless evacuation of a reddish black, sometimes coffee-colored, turbid not always abnormal odored urine, which after standing for twenty-four hours forms a brick-colored precipitate, which is sometimes streaked with blood. At the same time the secretion of milk is suspended, which phenomena is the first to attract the owner's attention. Rumination suspended, the food is rejected, and the desire for water is moderate. The patient remains isolated from the herd, with head pending, ears drooping, a viscid, saliva discharge from the mouth, mixed with mucus from the nose, muzzle moist, running at the eyes, though not constant, conjunctiva pale, making the traversing vessels look prominent but not engorged. At the outset the temperature is heightened, then varies, and eventually lowers. In standing posture the limbs approach each other; in a recumbent position the limbs are flexed, the head extended with the inferior maxillary resting on the ground, and if an unsuccessful attempt is made to get up the animal recedes back upon its side. During the first stage the gait is dragging, gradually getting unsteady, and at last altogether impossible, indicating a complete collapse of the nervous and physical force. The mucous membranes, particularly that of the buccal cavity, present a greyish hue; deglutition sometimes impaired; fecal matter at the outset soft and occasionally streaked with blood, the color depends upon the previously consumed food, and if the patient lingers any number of days the consistency is changeable. Peristaltic movements sluggish; never observed colicœ pains. The frequent respirations are sometimes accompanied by a cough and groans, without any forcible assistance of the abdominal and thoracic muscles. In the majority of cases the circulation keeps pace with the respiratory acts numbering 80, 100 to 120 per minute, and as the pulse increases it loses in tonicity. The action of the heart is, in general, scarcely perceptible. Specimens of

blood cirea, two thirds of a pint, withdrawn from the jugular vein, resembled more arterial than venous blood, coagulated within ten minutes, separating a reddish yellow tinged serum. It is understood that the complexity of the symptoms are not at all times alike, they being dependent upon the progress of the case. The most important diagnostic symptom is the character of the urine, but since we are unable at all times to be present personally, the history of the case as given by the attendant (however unreliable at times), must suffice, and is indispensable unless previous cases appeared in like manner, which, of course, must be traced in the same way.

AUTOPSY.—In one case I observed a post mortem rigidity which I did not notice in others. Tympanitis as well as emphysema I observed only in such cases as have been dead for several hours; whilst in those having just expired collapse of the abdominal cavity was found. The blood vessels of the subcutaneous tissues very seldom engorged. In some cases the muscles were pale, and in others bluish tinted. The adipose tissues usually presented a healthy aspect, though in some cases icteric. The abdominal cavity usually contained from one half to one pint of serum. Peripheric appearance of the stomach often deviated from the healthy state; its surface in relation to the liver and spleen partook from the former a yellowish color, and from the latter a sanguinous hue.

The contents of the rumen was nearly always voluminous; the reticulum partly or totally empty; the omasson filled with the usual quantity of dry food, in few exceptions, however, empty; and the abomasson contained mostly an offensive, mushy mass. The contents of the ileum, cæcum and colon in nearly all cases was of a like offensive character; often met with dry, bloody feces in the rectum, unless death occurred during purgation. The external presentation of the alimentary canal seldom bore any evidence which would indicate the condition of its inner aspect; the discoloration of one or the other organs, permeated with a yellowish tinge, are the most frequent superficial appearances. The epithelial lining of those destroyed presented an inflammatory character, whilst in those that died it was partially detached, of a greyish hue, the denuded muscular coat congested; the mucous lining of the small intestines relaxed, coated with bloody mucus, and distended by the presence of gas. The peyers patches were more voluminous and livid. The internal coat of the large intestines, and a portion of the ileum presented circumscribed greyish green or yellowish surfaces, with gangrenic odors, the destroyed were void of the latter change. The

liver of those destroyed in the second stage was merely enlarged, indicating an acute or sub acute inflammatory character; in those that died it was generally found to be undergoing decomposition; the color of its exterior was either of a yellowish, brownish or brick color; the veins traversing the liver contained a scanty quantity of blood of a purplish hue. The gall bladder was usually filled with a dark colored bile, the consistency of honey, or a more normal fluid of a yellow, greenish color. The spleen in destroyed cattle was enlarged, its texture but slightly altered, in fact merely in a hyperæmic state; in those that died it was more voluminous, emphysematose, pulp semifluid and viscid, analogous to decomposed blood. The lumbar and iliac glands in two cases I found considerably enlarged and in a decomposed state. Color and texture of the kidneys was varied, the parenchyma of those destroyed at the outset, presented a hyperæmic, slightly swollen, dark red, but compact appearance; while of those that died it was quite black or dark grey, flabby and seemingly at the point of dissolution. The bladder, in the majority of cases was filled with a blood red or a coffee colored urine which readily responded to the tests for albumen, the mucous lining relaxed without evidence of inflammation. Lungs generally healthy, the few exceptions showed that the inflammatory pathological deviations were caused by irrational drenching, which fact could be traced up to the larynx. In such cases not only the lining of the trachea, but also the adjacent muscular and cellular structures were infiltrated with blood. Heart pale and flaccid. In one case the endocardium was echymosed on the right, in another on the left, and in the third on both sides; of those that died it contained ash grey and dark colored fibrinous clots. In few exceptions the pericardium was the reservoir of several ounces of serum. The vena cava usually contained small remnants of blood or relative clots, some of which, however, on account of their consistency and discolor might have been taken for pathological products had not the topography of it been given.

The analysis of the blood undertaken by order of the Board of Health remained without result. In order to satisfy my own curiosity, I requested an expert to examine such blood microscopically (suspecting blood changes, such as anæmia, leucomia, and the like), but he informed me naively that he was only acquainted with the analysis of human blood. The symptomatology of this disease as described in the handbooks at my disposal differed with my cases, therefore I was more anxious to know with what I had to deal. I did not pursue my efforts any further at that time, as I was in hopes of very soon obtaining fresh

blood in order to have it analyzed through some one else, but have not since succeeded in obtaining any.

The progress of this disease is a speedy one, the majority expiring within two and a half and four days; in exceptional cases they may linger for seven and eight days. The course seems to be governed by the variation of temperature; I, at least, observed that those attacked in the months of July and August took a more rapid termination than those taken sick in September.

ETIOLOGY.—Some individuals claim that this is a mystery; others assert that it is originated by direct contagion communicated by cattle transported from the Gulf regions, but cases have come under my observation in which I was unable to trace any contagion, and by all appearances assumed the character of a spontaneous origin, for which reason I cannot agree with the aforesaid assertion unconditionally, although we have sufficient proof that cattle running at large, or in pasture where they may come in contact with the Texas cattle, are more readily exposed to infection than those kept in stables, and from May until October exclusively, and less in wet than in dry seasons, when the scarcity of fresh, good water compels them to quench their thirst with stagnant water, numberless infusoria and other ingredients deleterious to health are conveyed to the system in this way, the result of which is a contamination of the chyme, whose composition besides the withered grass consists of non-nutritious and even toxic vegetation (as they desire to refresh themselves with something cool and juicy will eat plants and drink water which at other times they would refuse), thereby infecting the alimentary canal and its associate organs. The injurious effects do not confine themselves to the vascular system alone, but also the functions of the adenotomic organs in the abdominal cavity, which are very instrumental in the formation and purification of the blood, will get impaired as soon as these obnoxious ingredients arrive for transformation or elimination, causing detrimental results not only to the glands themselves, but to the whole vital organism, which may, under favorable terms, be sufficient to develop an infectious germ giving impulse to spontaneous cases which (companions living under the same hygienic condition are prepared to adopt) multiply and disseminate the virus wherever they arrive amidst the mature bovine inhabitants of the hills, as well as low lands, valleys, creek and river precincts, and particularly those districts influenced by the tide.

Whether the infective principle is fixed or volatile, and what its *modus operandi* is, remains to be ascertained yet. Considering the local-

ity where the disease appears most frequent, we are obliged to pay its tribute to miasmatic influences. The evidences we have persuade us to believe that the system of the Southern stock must be impregnated with the effluvial atmosphere prevailing in that climate. This may account for the inviolability of themselves, and tenacity of the virus which our native stock inhale from their excrements. Even the expirium may be charged with poison, and will act as such in the first summer if they change their homes to any of the northeastern States. It is also claimed that they are subject to infection after being acclimated.

Not having anything essential to add to this miasmatic topic, I do not hesitate to acknowledge my predilection that the germ theory embraces the most plausible explanation for the enigmatic rapid dying away of whole droves, dairies, etc., within a week or two. Innumerable statements of such mortalities are recorded in agricultural reports and periodicals, but the sporadic cases, which are fully as important as to whether they are contagious or non-contagious, are almost entirely ignored, as in such instances the pecuniary loss is estimated more than science. To prevent the former it is necessary in the first place to examine thoroughly into the causes and nature of the disease, a problem which is yet to be solved, and must not be neglected if prophylactic measures are to be instituted and expected to prevent such calamities. My experience as to the period of incubation has not familiarized me enough with its circumstances to give a decisive judgment. Two days to five weeks seems to be the average time the poison requires to develop the disease.

PROGNOSIS is unfavorable, especially in midsummer.

TREATMENT.—No administered remedy as yet has given any satisfaction. The salycilic and carbolic acids, with some slimy infusions, seldom seemed to do any good. Bromide potassa, with glycerine extr. eucalyptus glob. and water proved to be no better, nor did quinia give any more favorable results. Bathings of the abdominal regions with warm water, mustard or red pepper were also resorted to. Must, however, admit that my therapeutical experiments were dissatisfactory. The rapid course and lack of time to give the proper attention to the action of medicines frustrated a systematic procedure.

It appears to me credible, if not indisputable, that this morbid condition belongs to the acute decomposition of the blood (sepsis sanguinis), and signalizes itself principally through the abnormal colored urine, undoubtedly owing to some liberated hematin and cholochrome. It makes its appearance in the hot summer months.

Calves and other ruminants have proven to be exempt from it. A superficial glance at this picture of infirmity will reveal at once that the analogy with anthrax is untenable. But, still, Mr. Fleming in his excellent work on sanitary science and police, favors that idea. I also express doubt as to paragraph 4, page 212, see vol. (Mr. Fleming's) which reads as follows: "Animals receiving the infection from Southern cattle do not communicate it to other natives, etc." I have no positive proof of the reverse, but to caution interested individuals I deem it necessary to cite two instances which will not correspond with the assertion of Mr. Fleming, namely, two years ago (midsummer) a farmer, Mr. Anderson, near Hamilton, Ohio, made a contract with two drovers to supply him with neat cattle, *home breed.* They filled their engagement with two lots. The second transport arrived two weeks after the first. Two days after the second lot arrived, one of them took sick and died. Twenty-four hours after, one of the first supply had its turn and died in two days. From this time on, one or two stepped out every day without distinction of the two supplies, until the drovers took away the remaining ten of the last lot, the others apparently mending. A repetition of the same occurrence took place at a distillery in my neighborhood. All went well until the second division was installed, when sickness set in, but owing to the low temperature which came to their rescue only four per cent. were lost. In this last instance we see the malady break out in the stable. Animals fed on hay and corn swill (seldom heard of), and in both instances the native cattle have been apparently disseminating the ailment amongst themselves. Not having any evidence as to whether one or all have been infected by the Texas stock, I leave it to others to make their own comment.

THE HISTOLOGY OF THE MAMMARY GLAND OF THE COW, AND THE PATHOLOGICAL CHANGES OF THE SAME BY PERLSUCHT.*

By N. Kolessnikow, St. Petersburg.
(Medical Student at the Pathological Institute in Berlin.)

Translated from Virchow's Archiv., Vol. 67, *Part* 4, *P.* 531.

By F. S. Billings, of Boston, Mass.

The mammary glands are constructed, as is known, on the type of conglomerate glands. They possess lobule formed by the union of the alveolœ, from which the ductus lactiferi proceed, the branches of which form the excretory channels. Between the lobule and alveolœ we find connective tissue in which vessels and nerves penetrate.

The alveolæ have, during the process of lactation, a clovated form, their length being 0.105–0.180 m.m., and diameter 0.060–0.120 m.m. The alveolœ form cysts in which we recognize the secreting epithelium and membrana propria. The epithelium which lines the inner surface of the membrana propria varies in different parts of the gland. That in the alveolœ being cylindrical and cupical in form, and from 0.012–0.018 m.m. in size, having a fine granular protoplasm with a large oval or round nucleus which is very refracting in the fresh preparations. But if the preparation be hardened in Müller's fluid or alcohol, and stained with carmine or hematoxylin, there may be seen one or two nucleoli in the nucleus. Under the epithelial layers may here and there be seen small, round subepithelial cells, sometimes pressed closely together, exactly corresponding to those forms described by Heidenhain† as a strata of young epithelial cells (germ cells) in the submaxillary gland. In other lobule the alveolœ possess a stratiform epithelium, the cells of which are polygonal in form. The innermost strata of these cells are the largest, and usually contain fat-globules. Beneath the inner layers of polygonal cells we find one or two rows of round subepithelial cells, varying from 0.003–0.006 m.m. in size.

The fat-globules are formed by the contents of the alveolœ and are designated *milk-corpuscles*. Upon the membrana propria we occasion-

* *Perlsucht* is the German name for the disease commonly termed "*tuberculosis*," but it is doubtful if this name is applicable, as will be seen from the following description. Therefore, for the want of a better, the German word is used in the translation.

† Stricker's Handbuch d. Gewebelehr, vol. i., p. 310.

ally find flattened polygonal cells, which by the action of a half p. c. solution of arg. nit. stained the protoplasm yellow or yellowish brown, whilst their contours were black. In all these cases the membrana propria appeared as an idiocyntric membrane of connective tissue, whose connection with the epithelial cells could not be distinguished. The epithelial cells are completely isolated from the membrana propria. I saw the epithelial cells become detached, scales, which upon a closer observation appeared to be isolated epithelial cells, which had been attached to the membrana propria by means of a glutinous substance.

Henle (Anatomy II., p. 46), was the first to observe and describe these stellate cells which belong to the membrana propria in the mammary gland of the human subject. Langer (Stricker Handbuch der Gewebelehre, 1872, p. 627), confirms Henle's observation, and says that the membrana propria consists of the so-called stellate cells. Kölliker (Handbuch der Gewebelehre, 1867), describes the membrana propria as a structureless membrane; and Furstenburg (Die Milchdrüse der Kuh Leipsig, 1869), came to the same conclusion after investigating the mammary gland of the cow. Langhaus (Virchow's Archiv., vol. 59), thinks that the stellate cells form no constant part of the membrana propria, but that it is a structureless membrane or composed of spindle-shaped cells.

In order to study the structure of the membrana propria, I took the normal mammary gland of the cow during lactation, and investigated fresh preparations as well as those hardened in Müller's fluid and alcohol, and stained with carmine, hematoxylin, eosin and tincture of iodine. I removed the epithelial layer from the membrana propria of some sections by penciling, others were shaken in distilled water.

In preparations prepared in this manner the membrana propria appeared as a membrane composed of flattened stellate connective tissue cells, united by means of their processes. By a closer investigation I convinced myself that their projections proceeded from the central part of the nucleated cells not as recticulum, but are to be considered as striæ seen in the compact, homogeneous membrane, and that these fibers with their stellate cells and the homogeneous membrane forms a histological unit. In other alveole these striæ were spindle-shaped, from 0.003–0.012 m.m. in diameter, and 0.015 m.m. apart, and ran parallel to the greater diameter of the alveole. From these striæ pass off processes which appear as fine condensations (and remind one of the recticulum), of the homogeneous membrane lying between the described striæ. In the center of the stellate, and in various parts of the spindle-formed

condensations, we find round or oval nucleü from 0.003–0.006 m.m. in size surrounded by a thin layer of protoplasm. For the histological unity of the homogeneous membrane with its striæ-like thickenings, speaks not only the transformation of this condensation in the membrane, but also the circumstance that this membrane could not be isolated by penciling nor through shaking it in distilled water. The membrane was uncolored by arg. nit. (half p. c.), whilst the glandular epithelium was stained yellow or brownish yellow; the membrana propria offered a tolerably obstinate resistance to the action of weak acids and dilute alkalic solutions. I found the membrana propria of the mammary gland of the cow had the same proprieties as other acinous glands as described by Boll (Bietrage zur mikroskopischen Anatomie der Acinösen Drüsen. Berlin, 1869). The interalveolar connective tissue is of a fine, fibrous variety containing oval and spindle-formed cells, which are often united to the membrana propria by their processes. The diameter of the interalveolar connective tissue is, as a rule, from 0.003–0.006 m.m. Between the blood capillaries of the interalveolar connective tissue and the outer surface of the membrana propria, we find encircling the alveolœ as described by Coyne (Centralblatt f. d. med. Wissench, 1875, p. 110), in the mamma of the human subject. In order to convince myself of the existence of perialveolœ (periacinic) lymph-spaces, I injected into the interalveolar connective tissue of the mammary gland of a fresh slaughtered cow a half per cent. solution of arg. nit. In several preparations we observed black or brown rings around the alveole which I am inclined to consider as lymph-spaces filled with arg. nit. In other specimens I detected these rings in connection with lymph-capillaries.

The lacteal ducts are lined with a single layer of cylindrical epithelium from 0.015–0.018 m.m. in length, and 0.006–0.012 m.m. in diameter. These cells possess a fine, granular protoplasm with an oval nucleus 0.003–0.006 m.m. in diameter which is situated near the membrana propria. The contours of the protoplasm cannot be distinctly distinguished in fresh preparations, so that it is difficult to distinctly define single cells.

The nucleus in fresh preparations is refracting, but those treated with Müller's fluid and alcohol become granular. Between the basic ends of the cylindrical epithelial cells one sees, here and there, small, round, oval cells, containing large granules, from 0.003–0.006 m.m. in diameter, the so-called subepithelial cells (germ cells). The cylindrical epithelial cells are not so projecting in the small, excretory ducts as they are in the

large, and they assume a cubical form as they enter the alveole, being 0.012 m.m. in size. In the smallest excretory ducts, I find the membrana propria possesses all the above mentioned characters. Their striæ runs parallel to the length of the excretory duct, the distance between each being from 0.009–0.015 m.m. The membrana propria could not be recognized in the excretory ducts; in its place I saw interweaving connective tissue fibers lying parallel to the length of the excretory ducts, as Henle has described in the mamma of the calf.

In the interlobular connective tissue, I found oval, stellate and spindle-shaped connective tissue cells, and elastic fibers as well as non-striated bundles, from 0.015–0.045 m.m. in thickness, surrounding the lobule. In these muscular bundles, particularly after staining the preparations with hematoxylin, I could distinctly recognize the non-striated muscular cells (myoblasts) having the following dimensions 0.030 m.m. long and 0.003–0.006 m.m. in diameter. The width of the interlobular connective tissue is from 0.180–0.510 m.m. The arteries and veins follow the same course as the excretory ducts. The capillaries wind spirally round the alveolœ, or form a network upon the external surface of the membrana propria.*

After these histological discussions, I will describe the anatomical changes upon the mammary gland of the cow from perlsucht.

Perlsucht, as is known, is peculiar to cattle, and develops itself upon the pleura and peritoneum in dense nodule the size of peas or hazel-nuts, appearing either as large, single papilliform tumor, or as small clusters united to each other and to the surface of the serosa by fibers of connective tissue. These are known in pathology under the name of nodule (perlknoten). The sectional surface of these neoplasms presents a dense and coarsely fibered appearance in the peripheries, and are soft and fine fibered in the center. In the latter case the center is caseous or calcareous. The lymphatic glands most frequently suffer from metastasis of the neoplasms, but sometimes the lungs and other organs are often complicated. As early as 1817 Dupuy described perlsucht as a specific disease, identical with tuberculosis of the human subject. In the year 1831 Gurlt (Lehr buch der pathologischen Anatomie der Havasangethiere), was opposed to Dupuy's opinion, and considered the nodule as sarcoma.

Virchow† was the first to thoroughly examine these neoplasms and

* The blood vessels were injected with the following: Berlin blue, 5 gr.; oxalic acid, 5 gr. gelatine, 50 grs.; aqua, 50 grs.

† Virchow. Wurzburger Verhandl., 1857, vol. 8, p. 143. Geschwulste, vol. 2, p. 739.

describe them as lymphosarcoma. The lymphosarcomatose nature of these neoplasms is grounded (accorded to Virchow) upon the fact that giant cells are developed in the connective tissue matrix, from the connective tissue cells, also from the persistency of the elements lying in the spaces of the coarse reticalium, as well as from the progressive, sometimes very acute growth of these nodules, and metastasis accompanying the same.

Gerlach,* Leisering,† Spinola,‡ and others have fed different animals with nodules, tuberculose caseous masses, as well as with the milk and flesh of cows which have succumbed to perlsucht In these as well as in other animals which have been similarly treated, neoplasms develop in various organs, and that the small nodules were observed to be very similar to the miliary tubercles of man.

From these experimental researches as well as the explanation and clinical detail of perlsucht, led these investigators to the conclusion that perlsucht by cattle, and tuberculosis of the human subject were identical, as Klebs § has already attempted to show in another way.

Schüppel ‖ examined the nodules (perlknoten) and tubercles histologically. He thought that both the nodule and the miliary tubercles developed out of giant cells, and that the giant cells were characteristic of both in diagnostic relations. Schüppel also based his assertions of the identity of nodules and miliary tubercle upon their histological construction.

Gerlach, Leisering and others returned to Dupuy's opinion. This opinion seems to have much stress for itself, but it is not universal as is shown by experiment, thus miliary tubercles develop themselves if they find a suppurative or a caseous center (Fränkel and Cohnheim, Ruge), and especially from foreign bodies on the introduction of neoplastic detritus (carcinoma, sarcoma and others), into the organism, or from the products of retrogressive metamorphosis of tissues (Vulpian, Lebert, Wyss).

The following question was submitted to me by Prof. Virchow: "What patho-anatomical changes take place in the mammary gland of the cow by perlsucht?" I accepted this proposal with great pleasure,

* Gerlach. Virchow's Archiv., vol. 51, p. 290. Archiv. f. Thierheilkunde, Berlin, 1875, vol. 1, p. 1.

† Leisering. Bericht uber das Veterinarwessen in Sachsen. 1864 and 1870.

‡ Spinola. Handbuch d. Patholog. und Therapie. Berlin, 1858. Vol. 2.

§ Klebs. Virchow's Archiv., 1868, vol. 44, p. 266; 1870, vol. 49, p. 291.

‖ Schuppel. Virchow's Archiv., vol. 56, p. 38.

because there has been so little done up to the present time to dissolve this question.

The material for the following experiments were from the mammary glands of six cows slaughtered on account of perlsucht.

In one case I found by an histological investigation of the mammary gland, lymphosarcomatosé neoplasms in a very premature stage; in the other five there was merely catarrhal inflammation of the lacteal ducts and chronic interstitial mastitis.

1ST CASE. METASTATIC LYMPHOSARCOMATOSE NODULES IN THE MAMMARY GLAND.

The animal was nine years of age, and by dissection we found nodules (Perlknoten) varying from the size of a pea to a hazel-nut, upon the pleura, in the lungs and bronchial glands.

There discharged from the sinus-lactiferi and ductus-lactiferi, a yellow pus-like fluid, containing small flakes. From a microscopal investigation of this fluid I discovered a large quantity of round cells (pus-corpuscles); also a number of white blood corpuscles, which contain one or two small nuclei, or a single large one. The above mentioned flakes appeared, under the microscope, as a conglomerate of round cells, which were held together by a granulose mass, soluble in acet. acid. The tissue of the mammary gland is compact, especially in the superior part of the gland. The interstitial connective tissue is very much developed, particularly in the vicinity of the "vena mammaria postica," where one distinctly observes white striæ of connective tissue; some parts of the gland lobule are atrophied, whilst other parts are elevated above the level of the cut surface, in the form of globules, about the size of peas; here and there one sees spots resembling adipose tissue, instead of the white lobule.

The lymphatic glands in the neighborhood of the "vena mammaria postica" are in a hypertrophic condition, and contain a great number of nodules, which cannot be distinguished from those on the pleura; the parenchyma has almost entirely disappeared in the center of these glands, and replaced by nodules (perlknoten), and we can only here and there recognize remnants of the glandular tissue in the peripheries of the gland between the nodules.

Different parts of the mammary gland were submitted to examination; some in the fresh condition, others after being hardened in Müller's fluid, or a 36 per cent. solution of alcohol. Some of the microscopical

sections were examined uncolored, whilst others were stained (according to Rauvier's* method), by hematoxylin and picrocarmial.

Sections taken from the surface of the fresh mammary gland, after being scraped or teased out, and treated with a half per cent. solution of natrium chloratum, presented, under the microscope, round, stellate, oval and spindle-shaped cellular elements, as well as the so-called giant cells. The round cells contain a large nucleus, with one or two nucleoli. In the stellate, oval and spindle formed cells, we found oval or biscuit shaped nuclei, with one or more nucleoli. The giant cells were round, stellate having small or large processes. The protoplasm of these cells was granular. The nuclei were situated either in the center of the cell, or occupied the whole or only part of the periphery. Sections of the fresh mammæ, made with a razor, demonstrated that in some places the interstitial tissues were in a fresh hyperplastic condition ; other places, on the contrary, were to be recognized in the later stadium of chronic interstitial mastitis in a high grade of development; so much so, that the interstitial connective tissue was present in double the quantity it is under normal conditions; further, between the lobule, and also the alveole of the glands, I saw round or oval nodule of a lymphosarcomatose character, which have been described as the elements of the nodule (perlknoten). The nodules are from 0.075–0.450 m.m. in size, and are composed of giant cells, connected together by comparatively long and ramifying processes. They are also united with the surrounding stellate connective tissue cells, and connective tissue fibers, which form the reticulum of the nodule. In the alveole of the reticulum, one finds giant cells which exactly correspond to those just described ; also elements containing a single nucleus, which resembles granulations, or lymph cells, between which one perceives fine fibers in connection with the reticulum. In some lobule, the excretory ducts were obliterated, whilst others were varicosely dilated, and filled with round cells.

The alveolœ were atrophied in some places, but in others they are distended, and lined with cubical epithelium. In their lumen, one finds a great quantity of fat-globules. These distended alveolœ were to be found in such places as we have above described as microscopic white lobules, resembling adipose tissue.

The investigation of preparations hardened in Müller's fluid, rendered it possible for us to explain, and more exactly comprehend, the above-mentioned patho-anatomical changes.

* Rauvier. Traite d'histologie. Paris, 1875.

In the above examinations of fresh preparations, treated with a half per cent. solution of natrium chloratum, I could not clearly define the epithelium of the alveolœ, and of the excretory ducts ; nor of the cellular elements of the previously described nodules (knokhen) ; the protoplasm of the cells was very indistinct, but the nuclei could be more distinctly seen. By treating specimens with Müller's fluid we render the cell elements more distinctly limited from their surroundings, while the protoplasm appears slightly granular, and the nucleus refracting, and of a round or oval form. The nuclei are seen more distinctly if the preparation be hardened in alcohol and stained with hematoxylin ; whereas, if the specimen be treated with picrocarmine, the nucleus is stained red and the protoplasm yellowish red, thus rendering the nucleus less visible. By coloring the specimen with carmine, this purpose is frustrated, for not only are the cell elements stained, but also the connective tissue. The case, however, was different when hematoxyxlin was used; here the nucleus was stained light violet, and the protoplasm bluish, whilst the connective tissue remained unstained.

Preparations prepared in this manner facilitates the study of the pathological processes in the interstitial and glandular tissues of the investigated organs. Therefore, I am in a condition to discuss more closely the general phenomena already given of the patho-anatomical alterations. The interstitial connective tissue is exceedingly developed, and infiltrated with one or more round cells. Between these round cells I found giant cells, either separate or connected with each other, their size being from 0.030–0.075 m.m., and containing from 3-16 round or oval nuclei—from 0.003–0.006 m.m. large. Most of these nuclei are found near the periphery, and very seldom in the center of the giant cells When the protoplasm is acted upon by a half per cent. solution of acet. acid, it becomes clearer, and the nuclei are more distinctly seen. The relations of their processes to one another, as well as to the stellate and to the reticulum, were exactly as we have already described. I could also distinguish isolated giant cells among the connective tissue fibers. If the preparation be teased out, the reticular tissue distinctly shows itself, and reminds one of the adenoid tissue of the lymph glands. Between the connective tissue fibres, which encircle the alveolœ, and those deposited around the neoplastic nodules, one sees various stadium of hypoplastic connective tissue, and whole rows of round cells, containing a large nucleus. In single preparations, the reticulum, which generally surrounded the giant cells, was replaced by round, oval, nay, even by epithelium cells. I recognize between the round and oval cells,

as well as in the reticulum, granular protoplasmic cells, about of hepatic cells or epithelial cells, which we find on the mucous membrane of the mouth. The cells contain 2-3 nucleü, 0.003–0.006 m.m., and from 2-5 nucleoli.

The blood and lymph vessels which we find throughout the normal interstitial tissue, are in many places obliterated, and the final ramifications of the blood vessels often appear as continuous lines of spindle-formed cells.

The patho-anatomical changes in the alveolœ and the excretory ducts deport themselves as follows: The single lobules are contracted, and far more distant from one another than in the normal condition; the alveolœ are distended cyst-like, through the obliteration of their excretory ducts, partly atrophied, partly obliterated in such a manner that in their place rows of spindle-formed cells were to be perceived, which showed their origin through their connection with the membrana propria of the excretory ducts.

These phenomena find explanation in the hyperplasia which has taken place upon the interlobular and interalveolar connective tissue, as well as in the great number of neoplastic nodules. In the partly obliterated, partly varicose distended excretory ducts, we notice a strata of cylindrical epithelium, under which may be seen one or more strata of germinal epithelium in a strata of proliferation; further, thick fibers of connective tissue, which stand in connection with the surrounding connective tissue and the membrana propria.

In this case we observe numerous nodules in the interstitial tissue of the mammary gland, which occasion through their development either distention or contraction of the alveolœ and excretory ducts.

We look upon these nodules as connective tissue neoplasms for the following reasons: Their matrix is connective tissue, which indicates the progressive development of the neoplasm, and surrounding the elements one finds extra-cellular products. In respect to the reticulum (which has already been described), of these neoplasms, together with the round elements and extra-cellular products found in it, I believe myself justified to consider these neoplasms as lymphosarcoma.

It remains yet to be mentioned, that the giant cells found in these neoplasms, which is already known to many, are essential elements of the nodule. According to Virchow,* giant cells form a constituent of

* It is due to Virchow that we no longer look upon all caseous products as tubercles. Through his researches the comprehension of tubercle is sharply defined. He considers tubercle to be a group of lymphomatose growths of an unstable character, whilst he describes lymphosarcoma, as well as perlknoten (nodule), as neoplasms, possessing a more permanent character.